

Jason Hyrum Steffen

Brinson Postdoctoral Fellow, Fermilab Center for Particle Astrophysics

Mail: MS 127, PO Box 500
Batavia, IL 60510

Phone: 630-840-6370
Email: jsteffen@fnal.gov

Citizenship: United States of America

Education

2006: Doctor of Philosophy in Physics

University of Washington, Seattle, Washington

Dissertation: *Detecting New Planets in Transiting Systems*

2003: Master of Science in Physics

University of Washington, Seattle, Washington

2000: Bachelor of Science in Physics and in Mathematics, *Summa Cum Laude*

Weber State University, Ogden, Utah

Research Interests

Cosmology, Dark Energy, Dark Matter, Extrasolar Planets, Gravitation

Scientific Employment

2006–Present: Brinson Postdoctoral Fellow, Fermilab Center for Particle Astrophysics

2001–2006: Research Assistant, University of Washington, Seattle

1999: National Science Foundation REU Intern, Inst. for Nuclear Theory, Seattle, WA

1998–2000: Research Assistant, Weber State University

Grants and Collaborations

GRANT/COLLABORATION LEADERSHIP

2009–2010: Spokesperson (PI), Fermilab T-991, “Chameleon Afterglow Search (CHASE)”.

2008–2011: Principal Investigator, NASA Kepler Participating Scientist Program, “Detecting Additional Planets in Transiting Systems Using Transit Timing Variations”.

2007: Co-Investigator, Spitzer Space Telescope Cycle 4, “Detecting Mars-mass planets with transit timing”.

2005–2006: Scientific Lead, Graduate Student Research Program (GSRP) grant from NASA Office of Space Science, “Finding New Planets in Transiting Systems”.

OTHER COLLABORATION MEMBERSHIP

2008–Present: Fermilab Holometer, (PI – C. Hogan).

2008–Present: NASA Kepler Mission, (PI – B. Borucki).

2008–Present: Resonant regeneration axion search, (PI – A. Chou).

2002–Present: Search for violation of the inverse-square law of gravity, (PI – P. E. Boynton & R. Newman).

2007–2009: The GammeV experiments, (PI – A. Chou & W. Wester).

Industry/Private Employment

2000–2001: L-3 Communications, Salt Lake City, Utah
Embedded Software Engineer

2000: McLeod USA Telecommunications, Salt Lake City, Utah
Pricing Analyst

1998–2000: Layton Ott Planetarium, Ogden, Utah
Planetarium Lecturer

Academic Employment

2007–Present: Adjunct Faculty, Waubonsee Community College, Department of Physics
Course: Introduction to Astronomy

2001–2006: Adjunct Faculty, Edmonds Community College, Department of Physics
Courses: The Solar System, Stars and Galaxies, Physics in Everyday Life

2005: Adjunct Faculty, Bellevue Community College, Department of Physics
Course: Physics for Scientists and Engineers

2000–2001: Adjunct Faculty, Salt Lake Community College, Department of Mathematics
Course: Intermediate Algebra

Awards

FERMILAB CENTER FOR PARTICLE ASTROPHYSICS
Brinson Postdoctoral Fellowship (2006)

UNIVERSITY OF WASHINGTON, DEPARTMENT OF PHYSICS
Mellam Fellowship (2001), Physics Department Fellowship (2001)

WEBER STATE UNIVERSITY
Weber State University Presidential Commendation Scholarship (1993)

WEBER STATE UNIVERSITY, DEPARTMENT OF PHYSICS
Outstanding Physics Graduate (2000), Paul H. Huish Scholarship (1999), Questar Corporation Scholarship (1998), Jim Bateman Scholarship (1998), Mary Margaret Clarke Scholarship (1997)

WEBER STATE UNIVERSITY, DEPARTMENT OF MATHEMATICS
Outstanding Mathematics Graduate (2000), Jerry Fields Award (1999)

Professional Affiliations and Honor Societies

American Astronomical Society, Golden Key National Honor Society, Phi Kappa Phi National Honor Society, Sigma Xi National Research Honor Society

Leadership and Service

2006–Present: Fermilab Center for Particle Astrophysics: Chalk Talk organizer, Munch organizer, Seminar organizer, webmaster, and various committees member.

2006–Present: Review panel member for NASA Origins 2009, External reviewer for NASA Origins 2008, referee for Astrophysical Journal, Astrophysical Journal Letters, Astronomy and Astrophysics, and Astroparticle Physics

1999–2000: President of Society of Physics Students
Weber State University Chapter

1998–2000: Secretary of Golden Key National Honor Society
Weber State University Chapter

Peer Reviewed

- Borucki, B., *et. al*, “Kepler Planet Detection Mission: Introduction and First Results”, Science, Accepted (2009)
- Gilliland, R., *et. al*, “Kepler Asteroseismology Program: Introduction and First Results”, PASP, 122, 131 (2010)
- Upadhye, A., **Steffen, J.H.**, & Weltman, A., “Constraining chameleon field theories using the GammeV afterglow experiment”, Phys. Rev. D, 81, 015013 (2010), arXiv:0911.3906.
- Steffen, J.H.**, Moore, M.W., & Boynton, P.E. “Optimal Simultaneous Estimation of Several Linear Parameters in the Presence of Lorentzian Thermal Noise”, Classical and Quantum Gravity, 26, 18, 185009, arXiv:0803.3199.
- Steffen, J.H.**, Upadhye, A., “The GammeV suite of experimental searches for axion-like particles”, Invited Review, Mod. Phys. Lett. A, 24, 26, 2053, (2009), arXiv:0908.1529.
- Chou, A.S., Wester, W., Baumbaugh, A., Gustafson, H.R., Irizarry-Valle, Y., Mazur, P.O., **Steffen, J.H.**, Tomlin, R., Upadhye, A., Weltman, A., Yang, X., Yoo, J., “Search for chameleon particles using a photon regeneration technique”, Phys. Rev. Lett., 102, 030402, (2009), arXiv:0806.2438.
- Steffen, J.H.**, “A statistical mechanics model for free-for-all airplane passenger boarding”, Am. J. Phys., Volume 76, No. 12, pp. 1114-1119 (2008), arXiv:0803.3199.
- Steffen, J.H.**, “Optimal boarding method for airline passengers”, JATM, 14 (3), 146-150 (2008), arXiv:0802.0733.
- Steffen, J.H.** & Valenzuela, O., “Constraints on the angular distribution of satellite galaxies about spiral hosts”, MNRAS, 387, 1199 (2008), arXiv:0712.2363.
- Chou, A.S., Wester, W., Baumbaugh, A., Gustafson, H.R., Irizarry-Valle, Y., Mazur, P.O., **Steffen, J.H.**, Tomlin, R., Yang, X., Yoo, J., “Search for axion-like particles using a variable baseline photon regeneration technique”, Phys. Rev. Lett., 100, 080402 (2008), arXiv:0710.3783.
- Agol, E. & **Steffen, J.H.**, “A limit on the presence of Earth-mass planets around a Sun-like star”, MNRAS, Volume 374, p. 941 (2007), arXiv:astro-ph/0610159.
- Steffen, J.H.** & Agol, E., “An analysis of the transit times of TrES-1b”, MNRAS Letters, Volume 364, Issue 1, p. 96 (2005), arXiv:astro-ph/0509656.
- Moore, M.W., **Steffen, J.H.**, & Boynton, P.E., “Optimal determination of the equilibrium displacement of a damped harmonic oscillator in the presence of thermal noise”, Rev. Sci. Inst., Volume 76, p. 085106 (2005), arXiv:physics/0412102.
- Agol, E., **Steffen, J.**, Sari, R., & Clarkson, W., “On detecting terrestrial planets with the timing of giant planet transits”, MNRAS, Volume 359, Issue 2, pp. 567-579 (2005), arXiv:astro-ph/0412032.
- Steffen, J.H.**, “Exploring 5th force interactions with 18th century technology”, IJMPD, Volume 13, Issue 10, pp. 2249-2254 (2004), arXiv:gr-qc/0503081.

Conference Proceedings and Other

- Steffen, J.H.**, *for the GammeV collaboration*, “Constraints on Chameleons and Axion-like Particles from the GammeV Experiment”, Proceedings of Identification of Dark Matter 2008 Conference, (2008), arXiv:0810.5070.

Agol, E., Cowan, N.B., Bushong, J., Knutson, H., Charbonneau, D., Deming, D., & **Steffen, J.H.**, “Transits and secondary eclipses of HD 189733 with Spitzer”, Proceedings of IAU Symposium No. 253 “Transiting Planets”, (2008), arXiv:0807.2434.

Steffen, J.H. & Agol, E., ASP Conference Series, “Developments in Planet Detection using Transit Timing Variations”, *Transiting Extrasolar Planets Workshop* MPIA Heidelberg Germany, Eds: Cristina Afonso, David Wel Drake & Thomas Henning, ASPC, Volume 366, p. 158 (2007), arXiv:astro-ph/0612442.

Steffen, J.H., Gaudi, B.S., Ford, E.B., Agol, E., Holman, M.J., “Detecting and Characterizing Planetary Systems with Transit Timing”, White paper submitted to the Exoplanet Task Force, (2007), arXiv:0704.0632.

Boynton, P.E., Bonicalzi, R.M., Kalet, A.M., Kleczewski, A.M., Lingwood, J.K., McKenney, K.J., Moore, M.W., **Steffen, J.H.**, Berg, E.C., Cross, W.D., Newman, R.D., Gephart, R.E., “Gravitation Physics at BGPL”, Proceedings of the Francesco Melchiorri Memorial Conference, New Astronomy Reviews, Volume 51, p. 334 (2007), arXiv:gr-qc/0609095.

Steffen, J.H., Ph.D. Dissertation, “Detecting new planets in transiting systems”, (2006), arXiv:astro-ph/0609492.

Berg, E.C., Cross, W.D., Newman, R.D., Boynton, P.E., Moore, M.W., & **Steffen, J.H.**, “Planned tests of the equivalence principle with a cryogenic torsion pendulum”, Contribution to *Testing The Equivalence Principle on Ground and in Space*, Ed. Lammerzahl, C., Everitt, C.W.F., & Ruffini, R., (Springer-Verlag: London), (2005).

Steffen, J.H., “Symmetry in a perturbed optical system”, (2005), arXiv:physics/0503129.

Berg, E.C., Bantel, M.K., Cross, W.D., Inoue, T., Newman, R.D., **Steffen, J.H.**, Moore, M.W., & Boynton, P.E., “Laboratory tests of gravitational physics using a cryogenic torsion pendulum”, Proceedings of 10th Marcel Grossman Meeting, Ed. Ruffini, R., et al. (World Scientific: Singapore), (2005), arXiv:gr-qc/0403021.

Talks, Posters, and Abstracts

ORAL PRESENTATIONS

Planetary Systems Characterization via Transit Timing Variations, Invited Talk, Putting our Solar System in Context: Origin, Dynamical and Physical Evolution of Multiple Planet Systems, Obergurgl, Austria (Scheduled: April 2010).

First Results of the Kepler Mission, Public Lecture, Clark Planetarium, Salt Lake City, UT (February 2010).

The GammeV and CHASE laboratory searches for chameleon dark energy, University of Utah Physics Colloquium, Salt Lake City, UT. (February 2010).

First Results of the Kepler mission, Weber State University Physics Seminar, Ogden, UT (February 2010).

GammeV-CHASE: A Laboratory Search for Dark Energy, 215th Meeting of the American Astronomical Society, Washington, D.C. (January 2010).

The State of Transit Timing Variations, Invited Talk, Towards Other Earths, Porto, Portugal (October 2009).

Finding Other Earths, Public Lecture for “Asset Earth” series at Waubesa Community College, Sugar Grove, IL (October 2009).

Detecting additional planets from the transits of known extrasolar planets, Embry Riddle Aeronautical University Physics Seminar, Daytona, FL (March 2009).

Detecting additional planets from the transits of known extrasolar planets, Fermilab Center for Particle Astrophysics Seminar, Batavia, IL (February 2009).

Constraints on Chameleons and Axion-like Particles from the GammeV Experiment, Lawrence Livermore National Laboratory Physics Seminar, Livermore, CA (November 2008).

Extrasolar Planet Detection via Transit Timing Variations, University of California at Santa Cruz Astronomy Planet Lunch, Santa Cruz, CA (November 2008).

Constraints on Chameleons and Axion-like Particles from the GammeV Experiment, University of California at Santa Cruz Physics Seminar, Santa Cruz, CA (November 2008).

Constraints on Chameleons and Axion-like Particles from the GammeV Experiment, University of Washington Physics Seminar, Seattle, Washington (October 2008).

Constraints on Chameleons and Axion-like Particles from the GammeV Experiment, Identification of Dark Matter 2008, Stockholm, Sweden (August 2008).

Detecting Additional Planets in Transiting Systems with Transit Timing Variations, Kepler Science Team Meeting, Boston, MA (May 2008).

Extrasolar Planet Detection via Transit Timing Variations, Carnegie Department of Terrestrial Magnetism Extrasolar Planets Seminar, Washington D.C. (March 2008).

Extrasolar Planet Detection via Transit Timing Variations, University of Maryland Astronomy Seminar, College Park, MD (March 2008).

Results from the GammeV Axion-like Particle Search, Johns Hopkins University Physics Department Seminar, Baltimore, MD (March 2008).

Results from the GammeV Axion-like Particle Search, University of Maryland Physics Department Seminar, College Park, MD (March 2008).

Extrasolar Planet Detection via Transit Timing Variations, Johns Hopkins University Center for Astrophysical Sciences Seminar, Baltimore, MD (March 2008).

Results from the GammeV Axion-like Particle Search, Harvard University Laboratory for Particle Physics and Cosmology Seminar, Boston, MA (February 2008).

Constraining the Angular Distribution of Satellite Galaxies about Disk-like Host Galaxies, SDSS Collaboration Meeting, Batavia, IL (November 2007).

The GammeV Particle Search Experiment, The 3rd Joint ILIAS-CERN-DESY Axion-WIMPs training-workshop, University of Patras, Patras, Greece (June 2007).

Detecting Terrestrial Planets in Transiting Planetary Systems, Northwestern University Astrophysics Seminar, Evanston, IL (May 2007).

Fundamental Gravitation Physics with a Torsion Pendulum, Princeton University Physics Seminar, Princeton, NJ (March 2007).

Detecting Terrestrial Planets in Transiting Planetary Systems, Princeton University Wunch Talk, Princeton, NJ (March 2007).

Developments in Planet Detection using Transit Timing Variations, Transiting Planets Workshop, Heidelberg, Germany (September 2006).

Development and Application of the Transit Timing Planet Detection Technique, 207th meeting of the American Astronomical Society, Washington D.C., (January 2006).

Finding Terrestrial Planets in Transiting Systems, Weber State University Physics Department Colloquium, Ogden, Utah (November 2004).

A Search For Inverse-Square Law Violation, 19th Pacific Coast Gravity Meeting, Salt Lake City, Utah (March 2003).

The Oscillating Neutrino: Some Possible Answers, American Physical Society, Four Corners Section Fall Meeting, Tucson, Arizona (October 1999).

POSTER PRESENTATIONS

The GammeV Chameleon Afterglow Search (GammeV-CHASE), Fermilab Users Meeting, Batavia, IL (June 2009).

Results from the GammeV Axion-like Particle Search, Fermilab Users Meeting, Batavia, IL (June 2008).

Results from the GammeV Axion-like Particle Search, 211th Meeting of the American Astronomical Society, Austin, TX (January 2008).

Planet Formation Models Meet Transit Timing Observations, Contribution to the Extreme Solar Systems Poster Session, Fira, Santorini, Greece (June 2007).

Constraining the Angular Distribution of Satellite Galaxies Surrounding Disk-like Host Galaxies, 209th meeting of the American Astronomical Society, Seattle, WA (January 2007).

Detecting New Planets in Transiting Systems, Conference on Planet Formation and Detection, Aspen, Colorado (February 2005).